New Header to be Inserted on Page 1, before line 1:

--CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to British Patent Application No. 0023267.8 filed 22 September 2000 and British Patent Application No. 0102041.1 filed 26 January 2001.

BACKGROUND OF THE INVENTION

Replacement Paragraph to be Inserted into Page 1

BDRs typically contain a voltage controlled crystal oscillator (VCXO) generating a local frequency which is usually varied by up to +/- 100ppm about a nominal frequency, typically 27MHz. Off air Moving Picture Expert Group (MPEG) transport stream/broadcast data streams have stable reference control signals embedded therein which are common to a 90KHz system clock reference (SCR). The microprocessor of a BDR produces a suitable pulse width modulated (PWM) waveform based on the SCR value to control the frequency of the VCXO. An accurate VCXO frequency allows accurate color subcarrier frequency generation, thereby allowing the generation of the final video output.

Replacement Paragraph to be Inserted into Page 2

Phase Alternation Line (PAL) decoders in televisions take composite video signals (i.e. video signals containing luminance, color and synchronization pulses which are generated by BDRs) from the video output of BDRs and recover the constituent red, green and blue components for display on the screen of the television or monitor. The PAL decoder in an average television can lock to a color subcarrier frequency generated by the VCXO deviating by up to +/- 200Hz. This equates to +/-45ppm about the subcarrier frequency of 4.43361975MHz. If the free run frequency of the 27MHz VCXO deviates beyond this point, as it can do when an inaccurate Pulse Width Modulated (PWM) is generated due to the absence of a stable SCR value, it is possible for the PAL decoder to lose color lock. This can result in color loss to the image displayed on the display screen, which is undesirable.

A similar problem is encountered when playing back BDR recordings on a video cassette recorder (VCR), for example if the user is trying to clear hard disk space in the BDR by transferring data onto a VCR. VCR's are less tolerant to errors in color carrier frequency than television systems and can introduce further errors to the recorded SCR. As such, when the recording has been transferred from the BDR to the VCR and the VCR is then played back on the display screen of the television system, the error in the color sub-carrier frequency results in deviations in PWM greater than the PAL decoder of the television can lock onto. This results in color loss of the image displayed on the display screen.

SUMMARY OF THE INVENTION

Paragraph to be Inserted into Page 3:

According to a first aspect of the present invention there is provided a method for the production of a pseudo stable reference control for the reliable generation of composite video signals from a broadcast data receiver (BDR), said BDR receiving video, audio and/or auxiliary data from a broadcaster, said BDR having storage means in which to store data and characterized in that said method includes the steps of said BDR producing a pseudo stable reference by extracting/deriving one or more values from frequency information embedded in incoming broadcast data and using said pseudo stable reference to control the frequency of a VCXO in the BDR, thereby allowing accurate color sub-carrier frequency generation for the generation of a video output via the BDR, or a VCR communicating with said BDR.

Replacement Paragraphs to be Inserted into Page 4:

The phase locked loop software compares the 90KHz stable frequency reference of SCR from the data stream to the local frequency value of the VCXO. The software operates to minimize the difference between the exact count of 90KHz stable clock cycles and the clock cycle count of the BDR local crystal oscillator, and preferably these should be the same. If there is any difference then the software either increases or decreases the VCXO frequency until the local 90KHz counts match those of the incoming data stream.

In one embodiment the pseudo stable reference is the average of the current PWM value, the most recent PWM value stored in the BDR/microprocessor and the oldest PWM value stored in the BDR/microprocessor. The values can be stored in memory in the BDR with the memory being of any suitable non-volatile form such as the Hard Disk Drive memory or Electrically Erasable Programmable Read-Only Memory (EEPROM) memory as both of these types will maintain the data in memory if the power supply is removed.

Replacement Paragraph to be Inserted into Page 6:

According to a second aspect of the present invention there is provided a broadcast data receiver, said BDR receiving video, audio and/or auxiliary data from a broadcaster, said BDR having storage means in which to store data and characterised in that the BDR is provided with means for producing a pseudo stable reference by deriving/extracting one or more values from frequency information embedded in incoming data, and said pseudo stable reference is used to control the frequency of a VCXO in the BDR, thereby allowing the generation of an accurate sub-color frequency for the playback of stored data from the BDR and/or a VCR.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Replacement Paragraph to be Inserted Into Page 9:

The pseudo stable reference is then used as the VCXO drive value when playing back data from the hard disk of the BDR. An accurate VCXO value allows the PAL decoder to lock onto the color subcarrier frequency and prevents color loss of the image displayed on the display screen.

Replacement Paragraph to be Inserted Into Page 10:

storage means, the BDR locks onto an off air data stream and derives a pseudo stable reference control value therefrom. This reference is based on the stable clock reference (SCR) embedded in the data stream. The extraction of SCR data is typically performed by the microprocessor in the BDR and the remaining data of the data stream is discounted. The microprocessor uses the derived SCR value to produce a suitable pulse width modulated (PWM) waveform to control the voltage controlled crystal oscillator (VCXO) of the BDR. The color subcarrier frequency generated by the VCXO is then locked onto by the PAL decoder of the television to prevent color loss of the image displayed on the television display screen.

In a similar manner, when digital data is being transferred from the BDR to a video cassette recorder (VCR), the BDR locks onto an off air data stream and derives a pseudo stable reference control based on the stable reference embedded in the off air data stream. The pseudo stable reference control value is then used to set the VCXO of the BDR to ensure that the digital data being copied onto the VCR has an accurate SCR value. This is particularly important as VCR's are less tolerant to errors in color carrier frequency than television systems, and can introduce further errors to the VCR recorded SCR. Thus the pseudo stable reference prevents color loss of images displayed on the television display screen from VCR data, which in turn has been recorded from BDR data.

The BDR records SCR values from off air data streams at pre-determined time intervals and stores these values in storage means of the BDR. In the event that during playback of stored digital data from the BDR, locking of the BDR to the off air data stream is lost, the BDR uses the last recorded SCR to continue playback of stored digital data without any loss of color of the vide output. Once locking of the BDR onto an off

New Paragraph for Page 11 to be Inserted After the Last Line:

While the invention has been described with a certain degree of particularly, it is manifest that many changes may be made in the details of construction and the arrangement of components without departing from the spirit and scope of this disclosure. It is understood that the invention is not limited to the embodiments set forth herein for purposes of exemplification, but is to be limited only by the scope of the attached claim or claims, including the full range of equivalency to which each element thereof is entitled.

Clean Version of the Claims

1.   (Amended) A method for the production of a pseudo stable reference control for the reliable generation of composite video signals from a broadcast data receiver receiving video, audio and/or auxiliary data from a broadcaster, said broadcast data receiver having storage means in which to store data, said method includes the steps of:

said broadcast data receiver producing a pseudo stable reference by extracting/deriving at least one value from frequency information embedded in incoming broadcast data: and

using said pseudo stable reference to control the frequency of a voltage controlled crystal oscillator in said broadcast data receiver, thereby allowing accurate color sub-carrier frequency generation for the generation of a video output via said broadcast data receiver, or a videocassette recorder communicating with said broadcast data receiver.

2.   (Amended) A method according to claim 1 wherein said derived pseudo stable reference is stored in said storage means and updated at pre-determined time intervals.

3.   (Amended) A method according to claim 1 wherein said storage means is in the form of a hard disk drive.

4.   (Amended) A method according to claim 1 wherein said broadcast data receiver is provided with micro-processing means which may extract the frequency information embedded in the incoming data streams and produce a suitable pulse width modulated signal to control the frequency of said voltage controlled crystal oscillator.

5.   (Amended) A method according to claim 1 wherein said at least one value is an average value of stable frequency references embedded in incoming data.

6.   (Amended) A method according to claim 5 wherein said at least one value is average pulse width modulated readings.

7.   (Amended) A method according to claim 6 wherein said average pulse width modulated readings are extracted/recorded during the phase locked loop of software routine of the micro-processing means.

8.   (Amended) A method according to claim 7 wherein the phase locked loop software compares a 90KHz stable clock reference from the incoming data stream to the local frequency of said voltage controlled crystal oscillator.

9.   (Amended) A method according to claim 5 wherein said average stable frequency reference values include the mean or median average readings thereof.

10.   (Amended) A method according to claim 6 wherein said pseudo stable reference is the average of the current pulse width modulated value, the most recent pulse width modulated value stored in memory in said broadcast data receiver and the oldest pulse width modulated value stored in memory in said broadcast data receiver.

11.   (Amended) A method according to claim 1 wherein timer means are provided in said broadcast data receiver to allow a pre-determined time period to pass before the micro-processing means extracts/records said at least one value from said incoming data stream.

12.   (Amended) A method according to claim 11 wherein said timer means is a real time clock embedded in the incoming data.

13. (Amended) A method according to claim 11 wherein said timer means is information derived from digital video broadcast service information.

14. (Amended) A method according to claim 1 wherein said at least one value is derived by locking the frequency of said voltage controlled crystal oscillator in said broadcast data receiver to an off air data stream and using the frequency information embedded in said off air data stream as said pseudo stable reference to control the frequency of said voltage controlled crystal oscillator.

15. (Amended) A method according to claim 14 wherein if there is a choice of digital or analogue broadcast signals from which said at least one value may be derived therefrom, said broadcast data receiver derives said at least one value from an analogue data signal.

16. (Amended) A method according to claim 14 wherein locking of the frequency of said voltage controlled crystal oscillator within said broadcast data receiver to an off air data stream is undertaken during or at the same time as playback of data stored in said broadcast data receiver and/or videocassette recorder.

17. (Amended) A method according to claim 14 wherein said broadcast data receiver records and stores at least one extracted stable frequency reference value from the off air data stream at pre-determined time intervals, so that if locking of said broadcast data receiver to the off air data stream is lost during playback of stored data from said broadcast data receiver and/or videocassette recorder, said broadcast data receiver uses the last recorded stable frequency reference value to continue playback of the stored data.

18. (Amended) A method according to claim 17 wherein once locking of said

broadcast data receiver to the off air data stream is resumed, the last recorded stable frequency reference value is discarded and the stable frequency value taken from the off air data stream is used.

19.   (Amended)   A method according to claim 14 wherein said broadcast data receiver is provided with means to watch and record different television channels simultaneously and when said broadcast data receiver is recording data from at least one channel, the, said broadcast data receiver switches the front end of the record channel off, extracts the stable reference value from the data stream of the channel being watched and uses the stable reference value to lock the watch and record channels together.

20.   (Amended) A method according to claim 19 wherein one of the watch and the record channels is an analogue channel, and the stable frequency value from this channel is used to lock the watch and record channels together.

21.   (Amended) A method according to claim 19 wherein said record channel(s) includes at least one from the group consisting of a channel from which data is being recorded onto a videocassette recorder or broadcast data receiver, a channel being used to play back video data from said broadcast data receiver, or a recording mode in which digital data is being copied from said broadcast data receiver onto a videocassette recorder.

22.   (Amended) A broadcast data receiver, said broadcast data receiver comprising:
        means for receiving video, audio and/or auxiliary data from a broadcaster;
        storage means in which to store data;
        means for producing a pseudo stable reference by deriving/extracting at least one value from frequency information embedded in incoming data; and
        said pseudo stable reference being used to control the frequency of a voltage

controlled crystal oscillator in the broadcast data receiver, thereby allowing the generation of an accurate sub-color frequency for the playback of stored data from the broadcast data receiver and/or a videocassette recorder.

23. (Amended) A broadcast data receiver according to claim 22 wherein said pseudo stable reference is used when at least one of said broadcast data receiver and videocassette recorder is deriving video data from said storage means.

24. (Amended) A broadcast data receiver according to claim 22 where in said at least one value is an average value of stable frequency information embedded in incoming data.

25. (Amended) A broadcast data receiver according to claim 22 wherein said at least one value is provided by locking the reference from said voltage controlled crystal oscillator within said broadcast data receiver to an off air data stream, and at least one stable reference value embedded in said off air data stream is used to generate a pseudo stable reference control.